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ABSTRACT

Decisive changes in the history of rhetoric occurred with the publication of Francis Bacon's "Advancement of Learning" and "De augmentis scientiarum" and "Leviathan" by Thomas Hobbes. Bacon and Hobbes responded to the problem of eloquence common to scientists in the early seventeenth century, which centered on three major philosophical-rhetorical concerns: an interest in the persuasive as opposed to the communicative aspects of rhetoric, an interest in faculty psychology, and the interpretation of method. Although Bacon and Hobbes addressed similar concerns, their treatments differ in the following ways: Hobbes favored the recording and teaching functions of scientific communication to the persuasive aspects; Hobbes, in his interpretation of faculty psychology shifted the emphasis from audience centered to speaker/writer centered rhetoric; and Bacon viewed rhetorical method as persuasion following scientific innovation, while Hobbes regarded rhetorical method as scientific invention and demonstration. The problems of the rhetorical dimensions of science and especially of the roles of speaker or writer became lost in the physical sciences after Newton but have reappeared in the twentieth century's interest in the rhetorically concerned history and philosophy of science. (Author/DF)

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Science and rhetoric from Bacon to Hobbes

Responses to the problem of eloquence

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Decisive changes in the history of rhetoric occurred with the publication of Francis Bacon's Advancement of learning (1605) and De augmentis scientiarum (1623) and of Thomas Hobbes's Leviathan (1651, 1668) and other works in the 1640s and 1650s. The changes had their origins in the nearly contemporaneous but unlike responses of Bacon and Hobbes to a problem common to scientists in the early seventeenth century: the problem of eloquence. The responses of Bacon and Hobbes may be characterized by their treatment of three major philosophical and rhetorical concerns: (1) an interest in the persuasive as opposed to the communicative aspects of rhetoric, (2) an interest in faculty psychology, and (3) the interpretation of method. The responses of Bacon and Hobbes are both essentially rhetorical, and both have been influential.

Decisive changes in the history of rhetoric occurred with the publication of Francis Bacon's Advancement of learning (1605) and De augmentis scientiarum (1623) and of Thomas Hobbes's Leviathan (English, 1651; Latin, 1668) and other works in the 1640s and 1650s.[1] The changes had their origin in attempts by scientists in the early seventeenth century to adapt to a common problem: the problem of eloquence. The rhetoric of Bacon and the arhetorical response of Sprat are well known. Less well known is Hobbes's response to the problem of eloquence, which I here explore by way of contrast with Bacon. Bacon and Hobbes address similar philosophical and rhetorical concerns though their treatment of these concerns differs markedly. In particular, Hobbes's response differs from Bacon's in at least three important respects. First, Hobbes establishes the importance of the recording and teaching as opposed to the persuasive functions of speech and writing in the sciences though he admits to persuasion a privileged place in the development of science. Second, Hobbes in his interpretation of faculty psychology shifts the emphasis from an audience-centered to a speaker- or writer-centered rhetoric while maintaining an interest in audiences. Third, whereas Bacon views method as persuasion following upon scientific invention or discovery, Hobbes regards method as invention and demonstration while allowing to the speaker or writer and audience a significant role in the method of science. The differences between Bacon's

response to the problem of eloquence and Hobbes's may be attributed to a variety of Continental influences but may owe something as well to Hobbes's reading of Aristotle's Rhetoric, of which Hobbes wrote an abbreviated translation (1637?). The problems of the rhetorical dimensions of science and especially of the roles of speaker or writer and audience in the development of science became lost in the physical sciences after Newton but reappear in the twentieth century in works in the history and philosophy of science, which are becoming increasingly rhetorical.

There is good reason to suppose that Hobbes might have been considerably influenced by Bacon's personality and his writings. Stephen (1961:12-13), largely on the authority of John Aubrey's notes on Hobbes's life, describes Hobbes's relationship with Bacon. Hobbes was acquainted with Bacon during the period between Bacon's loss of office in 1621 and his death in 1626, during which time Hobbes took notes for Bacon and helped to translate some of Bacon's essays into Latin. Stephen cites Hobbes, too, as Aubrey's authority for the familiar story of Bacon's death being caused by his experiment of stuffing a fowl with snow. Yet there are important differences between Bacon's thinking and Hobbes's. Stephen notes in particular the differences between Bacon's inductive and experimental science and Hobbes's essentially deductive method, Bacon's active interest in politics and Hobbes's detached observation, Bacon's allusive and metaphorical

style and Hobbes's style, in the words of Sprat, '"round, close, sparing of similitudes"' (Stephen 1961:13), and so on. Thus Hobbes absorbed less of Bacon's thinking than might at first be supposed though recent studies by Ross (1974) and others point to certain similarities. To the list of differences may be added Hobbes's view of communication in the sciences, which also contrasts with Bacon's. Hobbes departs especially from three characteristics which distinguish Bacon's theories of rhetoric: Bacon's interest in the persuasive function of rhetoric; his interest in faculty psychology, particularly the psychology of audience; and his conception of method as persuasion following upon scientific invention or discovery.

The study of Bacon's rhetoric has been, to use his own phrase, 'excellently well laboured' (III, 409). Recent work by Jardine (1974) and Stephens (1975) especially has demonstrated its thoroughly persuasive character. The standard work on Bacon's theories of rhetoric and communication is Wallace (1943).

The problem of eloquence

Bacon describes in the first book of Advancement and its expanded Latin version De augmentis the problem that eloquence presents for the scientist who wishes to communicate. He identifies three distempers of learning. The first of these, described in a passage abbreviated in De augmentis, is affected eloquence. Bacon cites several causes. These

include Martin Luther's awakening of antiquity, the subsequent interest in ancient languages and a delight in the 'manner of style and phrase' (III, 283) of ancient authors, itself precipitated by enmity against the schoolmen, and, finally, the interest in winning and persuading people 'of the vulgar sort' (III, 283). These causes--admiration of ancient authors, exact study of languages, hatred of the schoolmen, and an interest in preaching--brought in, writes Bacon, 'an affectionate study of eloquence and copie of speech' (III, 283):

> This grew speedily to an excess; for men began to hunt more after words than matter; and more after the choiceness of the phrase, and the round and clean composition of the sentence, and the sweet falling of the clauses, and the varying and illustration of their works with tropes and figures, than after the weight of matter, worth of subject, soundness of argument, life of invention, or depth of judgment (III, 283).

Bacon gives an extended series of examples, concluding that 'the whole inclination and bent of those times was rather towards copie than weight' (III, 284). Bacon avoids the stylistic excesses of the followers of Cicero and Demosthenes, but he does not himself adopt the ideal of simplicity later espoused by Sprat and members of the Royal Society.[2] Bacon's solution to the problem of eloquence, illustrated in his interpretation of faculty psychology and of method, is not to reject the persuasive powers of eloquence but to enlist those powers in the service of the new science. How he does so is the subject of the next two sections.

Psychology of audience

The foundation of Bacon's rhetoric, as indeed of his entire catalog of human learning, is his view of faculty psychology. In the second book of Advancement and De augmentis, Bacon divides human learning into three parts related to the three parts of man's understanding: history to memory, poetry to imagination, and philosophy to reason. His review of rhetoric falls under the third of these headings, but only after a lengthy series of dichotomies (including divisions into three or more parts), surveyed in Wallace (1943:6-7). In his review of philosophy Bacon gives particular attention to knowledge of the soul or mind of man, 'from the treasures whereof all other doctrines are derived' (IV, 396). Such knowledge is of two kinds: knowledge of the substance or

nature of the soul and knowledge of the faculties or functions of the soul. Of the first little is known except by religion. Knowledge of the faculties of the soul is divided in De augmentis into two parts: logic and ethics. The faculties, also identified in De augmentis, are six: understanding, reason, imagination, memory, appetite, and will. Of these, understanding and reason are the proper subject of logic, will and appetite (and Bacon adds affection) the proper subject of ethics. Bacon's definition of rhetoric takes in four of the six faculties.

Bacon's interest in the psychology of audience is evident in his definition of rhetoric.[3] The duty and office of rhetoric, he writes in Advancement, is 'to apply Reason to Imagination for the better moving of the will' (III, 409). In De augmentis, he adds 'to excite the appetite and will' (IV, 455), thereby including four of the six faculties. Bacon's definition of rhetoric admits of at least two interpretations. Both illustrate Bacon's interest in audience psychology. Interpreted narrowly (for example, Jardine 1974:216-26), rhetoric is restricted to eloquence or ornamentation alone. Since in Bacon's catalog of human learning rhetoric is conceived as a part of logic, logic itself and ethics may be regarded as extraneous to rhetoric, and rhetoric may be equated with eloquence alone. Bacon's treatment of rhetoric suggests such a view. In true value, eloquence is inferior to wisdom, he writes, yet popularly eloquence is more mighty, 'signifying that profoundness of wisdom will help a man to a name or admiration, but that it is eloquence that prevaileth in an active life' (III, 409).

Eloquence, in Bacon's view, is a call to action. But Bacon resists Plato's 'injustice' (III, 410) in comparing rhetoric to cookery. In accordance with Bacon's definition of rhetoric, eloquence is an appeal to imagination to contract with reason against the affections. Eloquence thus has moral force. It is the business of rhetoric, Bacon writes in De augmentis, 'to make pictures of virtue and goodness, ... to show them to the imagination in as lively representation as possible, by ornament of words' (IV, 456). If the affections were obedient to reason, there would be no great use of 'persuasions and insinuations to the will' (III, 410). Since the affections raise mutinies and seditions, however, 'reason would become captive and servile, if Eloquence of Persuasions did not practise and win the Imagination from the Affection's part' (III, 410). The affections, like reason, bear an appetite toward good, but whereas affection beholds present good, reason looks to the future. Since the present fills the imagination more than the future, reason is commonly vanquished, 'but after that force of eloquence and persuasion hath made things future and remote appear as present, then upon the revolt of the imagination reason prevaileth' (III, 411). In Bacon's view, rhetoric or eloquence is a call to action, specifically moral action. It is by definition a persuasive force.

A broader view of Bacon's theory of rhetoric (for example, Wallace 1943) embraces logic and ethics as well as eloquence or ornamentation. Such a view is, of course, implied in Bacon's definition of rhetoric. In order to move the imagination in

contract with reason against the affections, the speaker or writer must know the sciences that deal with reason and affection. There is further evidence that Bacon means to take this broader view. When in his survey of philosophy in Advancement and De augmentis Bacon arrives at knowledge of man himself, he cautions against taking too rigid a view of his dichotomies, and he addresses in particular the relationship between philosophy and rhetoric:

> And generally let this be a rule, that all partitions of knowledges be accepted rather for lines and veins, than for sections and separations; and that the continuance and entireness of knowledge be preserved. For the contrary hereof hath made particular sciences to become barren, shallow, and erroneous ... So we see Cicero the orator complained of Socrates and his school, that he was the first that separated philosophy and rhetoric; whereupon rhetoric became an empty and verbal art (III, 366-67).

Again in his review of rhetoric he recommends the broader view. Rhetoric is related, through the faculties, to logic and ethics. The government of reason is disordered in three ways: 'by Illaqueation or Sophism, which pertains to Logic; by Imagination or Impression, which pertains to Rhetoric; and by Passion or Affection, which pertains to Morality' (III, 409). Against the arts and faculties that disturb reason, the three kinds of knowledge work in harmony: 'for the end of Logic is to teach a form of argument to secure reason, and not to entrap it; the end of Morality is to procure the affections to obey reason, and not to invade it; the end of Rhetoric is to fill the imagination to second reason, and not to oppress it' (III, 409-10). Moreover, logic and rhetoric bear a special relationship to each other and to their respective audiences. Logic differs from rhetoric not only as the fist from the open hand, 'the one close the other at large' (III, 411), but especially with reference to audience: 'Logic handleth reason exact and in truth, and Rhetoric handleth it as it is planted in popular opinions and manners' (III, 411). Bacon commends Aristotle, therefore, for placing 'Rhetoric as between Logic on the one side and moral or civil knowledge on the other, as participating of both' (III, 411). The important difference between logic and rhetoric is the relationship of each to its audience:

for the proofs and demonstrations of Logic are toward all men indifferent and the same; but the proofs and persuasions of Rhetoric ought to differ according to the auditors ... which application, in perfection of idea, ought to extend so far, that if a man should speak of the same thing to several persons, he should speak to them all respectively and several ways (III, 411).

Finally, Bacon adds to his review of rhetoric in De augmentis a catalog which belongs to what he calls a promptuary or preparatory store. To this catalog belong 'Examples of the Colours of Good and Evil,' 'Examples of Antitheses,' and 'Examples of Lesser Forms' (IV, 458-93). These commonplaces or helps to the ready use of knowledge he introduces earlier in his discussion of logic as being common to both logic and rhetoric (though the first has specific reference to ethics), deferring fuller discussion to the section on rhetoric. Thus in the broader view of Bacon's rhetoric the three kinds of knowledge share common ends and means while logic and rhetoric differ in particular with reference to audience, the one offering demonstrations, the other persuasions adapted to different auditors.

Method as persuasion

Bacon's view of method is suggested by the place to which method is assigned in his catalog of human learning. By distinguishing between the invention or discovery of knowledge, on the one hand, and the transmission of knowledge, on the other, and by assigning method to transmission, Bacon indicates both his view of method and the importance which he assigns to the transmission of knowledge. Moreover, in his treatment of method as a part of the transmission of knowledge, he displays his persistent concern with the persuasive as opposed to the communicative aspects of the transmission of knowledge.

In his survey of knowledge of the mind or soul, he distinguishes between knowledge of the understanding and reason, or logic; and knowledge of the will, appetite, and affections, or ethics. The division serves well enough since the other faculties, memory and imagination, are related to history and poetry, respectively. However, imagination and memory reappear in Bacon's review of the intellectual arts, or logic. The intellectual arts are four: invention, judgment, memory, and elocution or tradition.[4] The role of imagination in its relation to rhetoric has already been observed. Bacon's division of the intellectual arts is suggestive of his notion of invention or discovery as prior to and separate from tradition or the transmission of knowledge.

Bacon's review of the four intellectual arts in Advancement follows the same scheme of overlapping dichotomies that characterizes the rest of his survey of human learning. Invention is of two kinds, the one of arts and sciences, the other of speech and arguments. Judgment is divided into judgment by induction and judgment by syllogism while memory or custody of knowledge is divided into the organ of tradition, the method of tradition, and the illustration of tradition, or rhetoric. There are, of course, further dichotomies. Bacon's division need not in itself imply a temporal sequence. That Bacon intends such a sequence is clear, however, from his introduction to the four intellectual arts:

> The Arts Intellectual are four in number; divided according to the ends whereunto they are referred: for man's labour is to *invent* that which is *sought* or *propounded*; or to *judge* that which is *invented*; or to *retain* that which is *judged*; or to *deliver over* that which is *retained* (III, 383-84).

The distinction between the invention or discovery of knowledge and its transmission is repeated in the introduction to the section on the transmission of knowledge in *De augmentis*:

> Let us now proceed to the art of Transmitting, or of producing and expressing to others those things which have been invented, judged, and laid up in the memory; which I will call by a general name the Art of Transmission. This art includes all the arts which relate to words and discourse. For although reason be as it were the soul of discourse, yet in the handling of them reason and discourse should be kept separate, no less than soul and body (IV, 438-39).

Again in the introduction to his review of method in Advancement, Bacon indicates that he regards method as part of the delivery of knowledge which follows upon its acquisition:

> Method hath been placed, and that not amiss, in Logic, as a part of Judgment: for as the doctrine of Syllogisms comprehendeth the rules of judgment upon that which is invented, so the doctrine of Method containeth the rules of judgment upon that which is to be delivered; for judgment precedeth Delivery, as it followeth Invention (III, 403).

In De augmentis, he gives to method separate identity as the 'Wisdom of Transmission' (IV, 448). Bacon's separation of the invention or discovery of knowledge from its delivery is illustrated also in his review of invention, the first of the intellectual arts. Bacon distinguishes between the invention of arts and sciences, which is true invention; and the invention of speech and arguments, which is simply a remembrance or suggestion. In De augmentis, he recommends in place of traditional invention what he calls learned experience, which treats of the methods of experimenting; and true invention, described in Novum organum (1620). True induction, in the view expressed in Novum organum (for example, IV, 105-6), arrives at at least a reasonable measure of certitude. Invention of speech and arguments is not properly invention but a recovering or resummoning of what one already knows. It is a chase of a deer in an enclosed park rather than in a forest at large. Nevertheless, Bacon accepts the tradition, including the commonplaces or preparatory store and the topics, though he revises the topics, especially the particular or subject-specific topics, in accord with the needs of the new organon, or new induction; and though he employs the devices of traditional logic, particularly the syllogism, rather as modes of persuasion in popular discourse than as modes of inquiry.[5]

In his account of rhetoric in its relation to the faculties and in his treatment of the conventional logic as devices of

persuasion, Bacon demonstrates his concern with the persuasive aspects of speech and writing in the sciences. This concern is particularly evident in his view of the method of transmission where he distinguishes between kinds of discourse appropriate for scientists and for popular audiences. This distinction is consistent with Bacon's view of the relationship between logic and rhetoric. However, as Stephens (1975) has shown, Bacon adopted persuasion as his dominant mode of expression even when addressing an audience of scientists.

Bacon's view of method contrasts sharply with that of Hobbes and is indeed one of the principal reasons for the differences between Bacon's resolution of the problem of eloquence and Hobbes's. Method for Bacon is a part of the fourth of the intellectual arts, the other two parts being the organ of tradition, or grammar, and the illustration of tradition, or rhetoric. The fact that he places method where he does has important implications for his treatment of method, for as Jardine (1974:especially 1-75) has shown method was variously interpreted in handbooks with which Bacon was probably familiar as either methods of presentation or tools of discovery though the distinction was not always clear. Bacon alludes to the controversy when he remarks at the outset of his discussion that 'For the Method of Tradition, I see it hath moved a controversy in our time' (I.I, 403). Bacon's decision regarding method is, of course, to restrict method to the presentation or transmission of knowledge only.[6]

In his survey of the methods of transmission, Bacon

generally divides method into two types, those appropriate to scientists and those suited to popular audiences (Wallace 1943:16-24, 133-46). Stephens (1975) demonstrates that Bacon increasingly employs to persuasive ends even those methods designed for scientific audiences.[7] At the outset of his review of the methods of transmission in De augmentis, Bacon rejects the method of dichotomies rigidly practiced by Peter Ramus and his followers. These men 'press matters by the laws of their method, and when a thing does not aptly fall into those dichotomies, either pass it by or force it out of its natural shape' (IV, 448). Bacon himself employs the method of dichotomies, but he employs it loosely, as has been observed. The kinds of method he generally divides into pairs, each pair including one method for those he calls 'the sons ... of science' (IV, 449), another for vulgar or popular audiences. First he distinguishes between the magistral method and the method of probation, called in De augmentis the initiative method. The magistral method is addressed to the 'crowd of learners' (IV, 449), the initiative method to the sons of science. The one inspires belief and use of knowledge, the other the examination and progression of knowledge. The methods are thus distinguished by audience and purpose. That the magistral method is persuasive in intent is evident in its attempt to inspire, not understanding only, but belief and use. That the initiative method is essentially persuasive is suggested by Bacon's assertion that its purpose is to

provoke further inquiry. Knowledge delivered to others 'as a thread to be spun on' (III, 404) ought to be presented as it was invented, not, indeed, so that it may be understood only, but so that it may grow. Knowledge gained by induction, Bacon adds in De augmentis, best serves this method. In Novum organum (for example, IV, 113), he again observes that his purpose is not to explain only but to provoke further inquiry. Thus the method of science itself has persuasive ends.

Another division of methods is the distinction between the enigmatical and disclosed (in De augmentis the acroamatic and exoteric) methods. This division also aims to separate the vulgar auditors from the select, the one method being more obscure than the ordinary, the other more open. The intent of the acroamatic method, Bacon writes, seems to be to 'remove the vulgar capacities from being admitted to the secrets of knowledges' (III, 405). Stephens (1975:ix, 137-71) includes as kinds of the acroamatic method Bacon's use of ciphers, secret alphabets, hieroglyphs, and the like (some of which are described in the section on the organ of discourse, or grammar, in De augmentis). So interpreted, the acroamatic method is powerfully persuasive in its ability to bring imaginative appeals even to the sons of science.

Another division of methods is delivery of knowledge in aphorisms and methods. Method is making an apparently complete and formal art out of a few axioms and observations, thereby

creating a sense of greater completeness or perfection than actually exists. Aphorisms, on the other hand, are made out of 'the pith and heart of sciences' (III, 405). Methods are more fit to win consent or belief while aphorisms invite further inquiry. Thus aphorisms have a special affinity with the initiative method, which also seeks to provoke inquiry. Stephens (1975:136) argues that the aphorism is indeed the key to Bacon's initiative method: in his adaptation of the aphorism to inductive method, Bacon most perfectly fuses style and content.

Other methods reviewed in Advancement and De augmentis include assertions and proofs, questions and answers, methods peculiar to specific subjects, and methods suited to the knowledge of particular audiences, these last including parables and similitudes employed 'in the infancy of learning, and in rude times' (III, 407) and having obvious persuasive force. Bacon adds mere mention of still other methods, among them the methods 'of Resolution or Analysis, of Constitution or Systasis' (III, 407), Bacon's version, apparently (Jardine 1974:39-41, 171), of methods which Hobbes employs to quite different ends.

The use and misuse of eloquence

Hobbes shared with Bacon and with other scientists of the early seventeenth century the common problem of eloquence.

Bacon resolved the problem by employing eloquence, broadly conceived, in the service of the new organon.[8] Hobbes approached the problem differently, but he reached, nonetheless, an essentially rhetorical solution. The differences between Bacon's response to the problem of eloquence and Hobbes's may be attributed to Continental influences primarily. Hobbes traveled frequently on the Continent both before and after his acquaintance with Bacon, and he met many of the leading intellectuals in the Europe of his day (Stephen 1961:1-69). Among the more likely influences on Hobbes's theories of rhetoric and communication is Descartes, on whose Meditations Hobbes wrote a series of objections. Hobbes shares Descartes's view of method as demonstration and his disinterest in other modes of discourse (on Descartes, Jamieson 1976:46-48). Hobbes also owes much to the methodological tradition of Padua, in particular as developed by Galileo and Harvey (Watkins 1973:32-42).[9] Hobbes, however, works out his own solution to the problem of eloquence, based partially upon his reading of Aristotle's Rhetoric and suggested, though not developed in detail, in Leviathan.

An early expression of the problem that eloquence poses for the scientist who wishes to communicate appears in Hobbes's commentary on Thomas White's De mundo dialogi tres (1642).[10] In the first chapter of his commentary, Hobbes addresses the question, raised by White, of whether or not philosophy ought to be treated logically. This issue may be the immediate

provocation for the development of Hobbes's ideas about rhetoric and communication. Hobbes argues that White is confused in asserting that philosophy should not be treated logically. White's reason, according to Hobbes, is that 'truth and sound knowledge cannot be acquired through a contest in rhetoric' (26). This is as much as saying that philosophy must not be treated logically because rhetoric teaches nothing certain, which, Hobbes writes, is a good reason that philosophy should not be treated rhetorically but is no basis for White's claim. In addition to his belief that rhetoric teaches nothing certain, Hobbes presses another objection to rhetoric. That is the problem of eloquence. In his commentary, Hobbes distinguishes four legitimate uses of speech. These are to teach, to narrate, to persuade, or to glorify or celibrate deeds. These ends correspond to logic, history, rhetoric, and poetry, respectively. Hobbes's particular concern in his appraisal of each of these arts is the role of eloquence in each. Logic, he writes, is a simple form of speech, 'without tropes or figure; for every metaphor has by its very nature a double significance and is ambiguous' (25). Therefore, metaphor is opposed to the aim of those who proceed from definitions, that is, logicians. History and poetry admit of metaphors but not of aphorisms while both 'Aphorisms and metaphors are appropriate in rhetorical style ... as both are of service in moving the mind' (25). Hobbes's apparent solution to the problem of eloquence is simply to banish metaphor and the aphorism from logical discourse and

to treat philosophy, or science, logically rather than rhetorically. In practice, the solution is not quite so simple, for Hobbes must concern himself with means of explaining the definitions of names 'in order to eliminate equivocation and ambiguity' (25). Thus his concern with definitions seems to arise from a rhetorical problem. To its solution Hobbes devotes a very considerable portion of his work.

The logical procedures for arriving at definitions are set forth in detail in the first part of Elements of philosophy, usually referred to by its Latin title De corpore (Latin, 1655; English, 1656). In addition, Hobbes introduces the problem of eloquence in Leviathan, where he provides a suggestion for a rhetorical solution to the problem. There appear occasionally in Leviathan echoes of Hobbes's objections to rhetoric as expressed in his commentary on White's De mundo. Hobbes again distinguishes between proper and improper uses of metaphor. Metaphor has no place in scientific demonstration, in particular. Absurd conclusions in the sciences arise from a variety of causes, chief of which is the failure of those who profess themselves philosophers to begin their ratiocinations from definitions, the method used successfully in geometry. Also among the causes of absurd conclusions is 'the use of metaphors, tropes, and other rhetorical figures, instead of words proper' (III, 34). Again, Hobbes writes, to reason upon 'metaphors, and senseless and ambiguous words' (III, 37) is to wander 'amongst innumerable absurdities' (III, 37). Metaphors 'In demonstration, in counsel, and all rigorous search of truth

... are ... utterly excluded' (III, 58-59). Metaphors and tropes of speech are less dangerous than inconstant names such as the names of virtues and vices, however, since metaphors 'profess their inconstancy' (III, 29). Metaphors, moreover, have some real ground 'that may be expressed in proper words' (III, 448) and so may be investigated. Metaphor remains a problem in scientific demonstration, nonetheless. Hobbes's distrust of metaphor, in demonstration at least, leads to his emphasis generally on the recording and teaching as opposed to the persuasive functions of speech and writing in the sciences though he introduces persuasion in his interpretation of method in Leviathan.

Psychology of speaker

In his approach to the problem of eloquence, Hobbes reworks two concerns in particular which he has in common with Bacon. In his treatment of faculty psychology, however, Hobbes addresses the psychology of speaker rather than audience, and in his interpretation of method Hobbes brings method into the service of invention and demonstration whereas Bacon restricts method to the delivery or transmission of knowledge alone. Hobbes's interpretation of psychology and of method is consistent with his interest in securing proper definitions. His explanation of human cognition constitutes the first three chapters and the sixth of Leviathan, Part One, 'Of Man'.

Chapters four, five, and seven present Hobbes's view of speech in its relation to science and belief.[11]

Hobbes's view of cognition is essentially similar to Bacon's though to the degree that Bacon is concerned with speech in its relation to cognition or the acquisition of knowledge he conceives this relationship as a problem in logic only (Jardine 1974:76-168; on the role of grammar in cognition, IV, 439-48, especially 441-42, and Jardine 1974:19-20). Hobbes's view, like Bacon's, is essentially empirical. Cognition begins in sense and works through imagination, other activities such as memory and understanding being merely other names for imagination. There is, Hobbes writes, no conception in the mind that has not its origin in sense. The cause of sense is the external body or object which presses the organ proper to each sense. Sensible qualities are motions of matter in the object that causes them, and these motions in turn cause motions in the perceiver. For example, if colors and sounds were in objects, they could not be severed from them, 'as by glasses, and in echoes by reflection, we see they are' (III, 2). Thus all sense, and hence all knowledge, has its origin in motion. Imagination and memory are also explained with reference to motion. When a thing is in motion, Hobbes writes, it remains in motion unless something stops it. As it is in objects, 'though the wind cease, the waves give not over rolling for a long time after' (III, 4), so it is in the internal parts of man. This internal motion is imagination,

or decaying sense. Decaying sense is called imagination, but when that sense is old, and past, it is called memory. Thus imagination and memory are but two names for the same thing. Much memory is called experience. Imagination is of two types, simple and compounded, the one a single image, the other a composition of several images. Imagination raised in man by words or other voluntary signs is called understanding. Understanding is the ability, peculiar to man, to conceive, to think, to name, to affirm and negate, to speak. And speech, in Hobbes's view, is the foundation of reason and the sciences.

Two other processes bear upon Hobbes's theory of speech. The first he calls the consequence or train of imagination, by which he means the succession of thoughts from one thought to another, or mental discourse, as distinct from discourse in words. At this point Hobbes's psychology begins to look more like Locke's theory of association than the older (though in Hobbes's version much simplified) faculty psychology. In Hobbes's psychology, mental discourse is of two kinds, unregulated and regulated. Just as motions made in sense succeed each other uncertainly, so also the internal motions, 'relics of those made in the sense' (III, 11), continue together after sense in a similar uncertain pattern. Unregulated mental discourse is just this random train of imagination while a regulated train of thoughts is mental discourse guided by some desire or fear. Besides sense,

thoughts, and the train of thoughts, Hobbes concludes, the mind of man has no other motion, all other faculties which seem proper to man being helps of speech and method, which are increased by study and industry. Later in Part One, however, he turns to another process related to his theory of speech, that is, his analysis of the passions. There are in animals, he writes, two sorts of motions, vital motions, including generation, the flow of blood, pulse, breathing, and so on; and voluntary motions, as to go, to speak, to move, and the like. The small beginnings of motion Hobbes calls endeavor. Endeavor toward something that causes it is called appetite or desire while endeavor away from something is called aversion. Hobbes includes a list of appetites and aversions, or passions, by their various names. Deliberations respecting the passions are resolved by an act (not a faculty) of the will. Hobbes's review of voluntary motion emphasizes his conception of speech as a voluntary act (with all of the ambiguity that the term has for Hobbes), and it allows him to distinguish between the assertions of science and a variety of other forms of speech. Passions, like thoughts, may be expressed indicatively, but the passions also have expressions peculiar to themselves. The language of deliberation is subjunctive; that of desire or aversion, imperative; that of vainglory or indignation, optative; and that of inquiry, of the desire to know, interrogative.[12]

Method as inquiry

The process of cognition in the individual knower is the foundation of Hobbes's conception of method, just as Bacon's quite different view of faculty psychology is fundamental to his view of method in particular and of the transmission of knowledge generally. Hobbes's view of method restricts method to invention and demonstration. Two aspects of his theory bear upon his notion of communication, however. First, the two parts of method, invention and demonstration, correspond to the first two uses of speech as outlined in Leviathan. Second, in his description of method in Leviathan Hobbes introduces persuasion, not as an act of communication following inquiry, but as a part thereof. Bacon certainly would not have approved of Hobbes's method, for Hobbes admits to both syllogistic demonstration, or teaching, and rhetoric a role in inquiry. Bacon himself, however, as Jardine (1974: 86) points out, admits to syllogistic demonstration a place in scientific reasoning.

As Hobbes demonstrates in his review of human cognition, method is a help to cognition developed by instruction and discipline and distinguished from other speech acts by its emphasis on assertion and negation. Hobbes's concept of method is set forth in some detail in De corpore. The discussion of method in De corpore is entirely logical but parallels in its interpretation of the uses of speech the

exposition on speech and method in Leviathan. Hobbes in De corpore divides method into invention and demonstration. Invention as a part of method he equates with the familiar method of composition and resolution to which Bacon alludes in his survey of method and which Hobbes apparently learned from Galileo and Harvey (Watkins 1973:32-42), whom, among others, he acknowledges in the dedication of De corpore. The resolutive and compositive method Hobbes calls analytical and synthetical. Every method by which we can find out the causes of things is one or the other, or part of each. Method which proceeds from sense to principles is analytical while that which begins at principles is synthetical. Hobbes illustrates the use of the analytical and synthetical method in the determination of causes and effects. For example, the idea of a single thing, such as gold, may be resolved into the ideas of solid, visible, heavy, and so on. These universals may be further resolved into ideas more universal still. The cause of these universals is one universal cause, which is motion. Such knowledge of causes, arrived at analytically, is the knowledge of singular things. This process of inquiry may be reversed, in the inquiry into the effects of motion, as, for example, 'what motion makes a straight line, and what a circular' (I, 71). This kind of inquiry is compositive or synthetical. It is the method of geometry, for example. Such inquiry may be extended from knowledge of effects of simple motion to knowledge of effects

of one body upon another, knowledge of the effects produced by the parts of any body, effects of motions of the mind, and so on. Moreover, the variety of things in question calls for a variety of approaches, sometimes analytical, sometimes synthetical.

Speech enters into method as a part of invention but especially in demonstration, or teaching. Hobbes distinguishes between words as marks in invention, as signs in demonstration. What is discovered by invention will perish unless marks are used as aids to memory. Marks serve to register one's own inventions to others. Demonstration supposes two persons and syllogistic speech. Demonstration is leading the mind of the learner to the knowledge of invention. Thus the same method that served for invention will serve also for demonstration, excepting that that part of method which proceeds from sense to universal principles may be omitted, as known to all. Demonstration, therefore, is wholly synthetical,

> consisting of that order of speech which begins from primary or most universal propositions, which are manifest of themselves, and proceeds by a perpetual composition of propositions into syllogisms, till at last the learner understand the truth of the conclusion sought after (I, 81).

Primary principles or propositions are of two kinds, one of things that have some conceivable cause, the other of things that have none. Things that have no conceivable cause may be defined by perfect and clear ideas, 'as when we define motion to be the leaving of one place, and the acquiring of another continually' (I, 81). Definitions of things that have some cause are procedural; that is, they express the cause or manner of a thing's generation, 'as when we define a circle to be a figure made by the circumduction of a straight line in a plane' (I, 81-82). Demonstration is reasoning from such definitions, or, strictly, 'a demonstration is a syllogism, or series of syllogisms, derived and continued, from the definitions of names, to the last conclusion' (I, 86).

De corpore presents a more strictly logical explication of method than appears elsewhere in Hobbes's work. Indeed his treatment of method in religious and political contexts in particular gives credence to the charge of nominalism frequently leveled against him (Wallace 1973:259-60; Watkins 1973:99-118). There may be no disputing the charge on philosophical grounds. But Hobbes himself might have viewed the problem of assigning proper definitions as a rhetorical rather than a logical problem. Indeed in offering a logical solution to a rhetorical problem, as Hobbes apparently does in De corpore, he may well be leaving himself open to a charge similar to that which he himself leveled against White. That Hobbes should offer a rhetorical solution to

the problem of eloquence is consistent, therefore, with his own thinking about the relation between logic and rhetoric.

In Leviathan Hobbes distinguishes among the uses of speech as he does in De corpore. The general use of speech is to transfer mental discourse, or the train of imagination, into verbal discourse. In this way, Hobbes's theory of speech is linked to his psychology. The transfer of mental discourse into verbal discourse has two purposes, first, to register the consequences of our thoughts, that is, to serve as marks or notes of remembrance; and, second, to signify to another our conceptions, thoughts, and passions. For this second use words are called signs. This distinction between the two uses of speech parallels Hobbes's similar distinction in De corpore. Next, Hobbes identifies special uses of speech. These are to register the causes of things and their effects, to share that knowledge with others, to make known our wills, and, last, to please and delight ourselves. Again, the first two uses correspond to the uses of speech in invention and demonstration. The first two uses are logical, the second two, rhetorical. Hobbes illustrates the first two uses, then moves to a consideration of the distinction between science and belief in chapter seven. He illustrates the registering or recording function of speech by reference to innumerable triangles. If a man that had no use of speech had a triangle set before him, he might by meditation compare and find that the three angles of the triangle are equal to

two right angles that stand by it. However, if another triangle of a different shape were displayed to him, he could not know without a new labor that the three angles were equal to the two right angles. So it is also in the case of numbers on a clock or the operations of arithmetic. With the aid of words and numbers, however, inventions can be registered in general terms and remembered as universal rules, as '<u>every triangle hath its three angles equal to two right angles</u>' (III, 22).

Thus far Hobbes is consistent with the logical exposition offered in <u>De corpore</u>. However, in his account of the second use of speech and in his distinction between science and belief, Hobbes introduces a rhetorical approach to the problem of arriving at proper definitions. Reason, he writes, is, like arithmetic, the conceiving of sums and remainders. In logic, reasoning takes the form of adding two names, to make an affirmation; two affirmations, to make a syllogism; and many syllogisms, to make a demonstration. Similarly, the conclusion of a syllogism, subtracted from one proposition, leaves the other proposition. Here, as elsewhere, Hobbes implies that the names with which reasoning begins must be generally agreed upon: 'For REASON, in this sense, is nothing but <u>reckoning</u>, that is adding and subtracting, of the consequences of general names agreed upon for the <u>marking</u> and <u>signifying</u> of our thoughts' (III, 30). That the words which record inventions must be agreed upon by men other than

the inventor introduces a rhetorical dimension to the problem of arriving at proper definitions. The necessity of social assent at the outset of demonstration is expressed more emphatically elsewhere in Hobbes's works, for example, in chapter eighteen of Philosophical rudiments concerning government and society (the third part of Elements of philosophy, usually referred to by its Latin title De cive, Latin, 1642; English, 1651), where Hobbes argues that words that make up a proposition derive their meaning from common assent, which assent is called science. In Leviathan he provides a means of resolving differences in cases in which men cannot agree upon definitions and the consequences derived from them by demonstration. This means is recourse to an arbitrator or judge. Hobbes's suggestion seems to have its roots in a passage on the subject of equity in Aristotle's Rhetoric (1932:76-78).[13] Aristotle lists a number of actions of equity, including submission to an arbitrator or judge. Hobbes in Whole art of rhetoric translates as follows: 'And to submit rather to the sentence of a judge, than of the sword. And to the sentence of an arbitrator, rather than of a judge' (VI, 446). Hobbes recommends submission to an arbitrator or judge in his own discussion of equity in the fifteenth chapter of Part One of Leviathan. And in his review of reason and science he again has reference to this concept. Just as in arithmetic unpracticed men and professors themselves might err, so also in other subjects

the most practiced men may deceive themselves. Nor does the reason of any number of men insure certainty. Therefore, in controversy men must have recourse to an arbitrator or judge:

> And therefore, as when there is a controversy in an account, the parties must by their own accord, set up, for right reason, the reason of some arbitrator, or judge, to whose sentence they will both stand, or their controversy must either come to blows, or be undecided, for want of a right reason constituted by nature; so is it also in all debates of what kind soever (III, 31).

Hobbes thus introduces debate about the meanings of words, perhaps, and certainly about the derivation of consequences, as a part of reasoning and science.

That Hobbes regards the conclusions of science as subject to debate is evident in his definition of science and of the ends of discourse. Science is distinguished from sense and memory, these being born within us, whereas science is developed by industry and experience. Science is specifically practice in the method Hobbes proposes:

> first in apt imposing of names; and secondly by getting a good and orderly method in proceeding from the elements, which are names, to assertions made by connexion of one of them to another; and so to syllogisms, which are the connexions of one assertion to another, till we come to a knowledge of all the consequences of names appertaining to the subject in hand; and that is it, men call SCIENCE (III, 35).

Science is not always certain but depends upon the inventor's facility in demonstration. The signs (perhaps demonstrations) of science are some certain, some uncertain. Certainty in sciences is established 'when he that pertendeth the science of any thing, can teach the same; that is to say, demonstrate the truth thereof perspicuously to another' (III, 37). Uncertainties occur 'when only some particular events answer to his pretence' (III, 37). Even certain conclusions, however, are apparently uncertain. Hobbes says as much in his review of the ends of discourse:

> No discourse whatsoever, can end in absolute knowledge of fact, past, or to come. For, as for the knowledge of fact, it is originally, sense; and ever after, memory. And for the knowledge of consequence, which I have said before is called science, it is not absolute, but conditional (III, 52).

Science, though conditional, is more certain than either opinion or belief. Discourse which is not founded in definitions or which fails to join definitions rightly into syllogisms is called opinion. Discourse which begins with the speech of someone of undoubted honesty and ability to know the truth is called belief. Neither is science. Hobbes, it seems, did not carry his interest in Aristotle so far as to admit the credibility of the speaker a place in the method of science.

Postscript: Newton and after

There is no doubting Bacon's very considerable influence on rhetoric in the seventeenth and eighteenth centuries. The case is well documented (for example, Howell 1956, 1971). Hobbes is a more difficult subject. He apparently lent support, as did Bacon, to efforts of the Royal Society to reform English prose (Williamson 1951:296-97, 307-8; Howell 1956:388) but had little influence on the larger tradition of rhetoric. Hobbes, however, is squarely within the scientific tradition in its formative stages. His problem of assigning proper definitions is resolved by Newton's (1934:6-12) claim in the list of definitions prefixed to the Principia (1686) that concepts such as space and time are absolute and hence require no definition. But the problem of assigning definitions reappears in works in the history and philosophy of science in

the twentieth century, which, despite their distance from Hobbes in time and probably sympathy, address mutual concerns. Stephen Toulmin (1972:159-65), for example, to cite a single instance, advocates the use of procedural definitions presented at public demonstrations (that is, among scientists within a given discipline) as a means of testing the competence of a neophyte scientist or of reviewing the adequacy of new concepts within that discipline. In such a demonstration the role of audience as a participant in debate becomes as important and as prominent as the role of speaker (the judge in this instance being the collective aims or ideals of the given discipline). At the risk of implying a philosophical kinship between Hobbes and certain twentieth-century historians and philosophers of science, it may be accurate to cite a return to rhetorical activity in the sciences, specifically public activity directed to the resolution of differences about the meanings of words, activity of a kind that Hobbes advocated.

[1]Dates of works of Bacon and Hobbes, excepting the probable date of initial publication of Hobbes's brief of Aristotle's Rhetoric, are from Wallace (1943:1-2) and Ross (1974:vii-x), respectively. Howell (1956:384) reviews publication data on Hobbes's Whole Art of Rhetoric. Citations from the works of Bacon and Hobbes are from the editions by Spedding (1857-74) and Molesworth (1839-45a), respectively, and from Jones's (1976) edition of Hobbes's commentary on Thomas White's De mundo dialogi tres. References to volume and page number are given in the text. Bacon's Advancement of learning appears in Spedding, III, 253-491; De augmentis scientiarum in Spedding, IV, 273-V, 119. Titles of other works are regularly identified in the text. Reference to Jones is to page number only.

[2]The attitude of Sprat in its emphasis on the objects of science is antirhetorical or at least arhetorical (Scott 1975:442).

[3]Jardine (1974:76-96) reviews Bacon's faculty psychology in relation to his theory of knowledge.

[4]Thorpe (1940:69-78) cites inconsistencies in Bacon's theory of imagination, especially as it relates to poetry.

[5]The view of the syllogism as ornament for discourse in the popular sciences appears in De augmentis (IV, 411) and in Novum organum (for example, IV, 17, 24, 42, 52, 112). Also see Jardine (1974:for example, 75, 84-87) and Stephens (1975: for example, 40-42, 48).

[6]Wallace (1973) points out that Bacon actually uses the

term to refer to a variety of methods, including the new organon. But see Jardine (1974:29, note 2).

[7]Jardine (1974:for example, 74-75, 173) supposes that all of the methods, excepting the initiative, are designed for popular audiences.

[8]Scott (1975) adds a useful qualification on this view of audience-centered or listener-oriented rhetorics, which often serve 'the nature of things' (Scott 1975:442). The role of rhetoric as the handmaiden of the new science Scott calls '"managerial"' (Scott 1975:445). Hobbes's speaker-centered rhetoric, in contrast, involves audience in a significant way in the development of the conclusions of science.

[9]Crombie (1953) traces the roots of the Paduan tradition to Robert Grosseteste and, of course, Aristotle.

[10]White's De mundo was published at Paris in 1642. I have not seen this work. According to Stephen (1961:34), Hobbes set to work on Leviathan in or about 1642.

[11]Roughly parallel treatment of this material, or parts of it, appears elsewhere in Hobbes's work, for example, in Human nature, the first part of Elements of law (written in 1640 and published in 1649); and in De homine, the second part of Elements of philosophy (1658). Parts of De homine (Molesworth 1839-45b) are translated in Wood (1972).

[12]A somewhat more detailed review of Hobbes's psychology of speech appears in Thonssen (1932).

[13]Thorpe (1940:128-33) argues that Hobbes's aesthetics may owe something to Aristotle's Rhetoric.

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